Final Report

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Canola Agronomy Report

Conducted by
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SUMMARY

CANOLA AGRONOMY REPORT

Jim Bessel
Melfort Research Station

Research on the agronomy of high yielding canola lines was completed in February 1990 and is summarized in this report. In general, moisture stress in 1988 and 1989 gave poor canola growing conditions. Therefore, recommendations arising from this report may be inappropriate for conditions more typical for production of canola.

A. NITROGEN RESPONSE

Objective: To identify whether an economic difference in response to nitrogen fertilizer exists among canola cultivars of diverse genetic backgrounds.

There was neither a nitrogen response nor an interaction of cultivar and nitrogen treatments at either 1988 site. Westar was outyielded only by Global at one of the two locations. However, Global was 15 days later maturing than Westar and 4.4 days later than AU008 which makes it generally unsuitable for production in the northern Prairies, (Table 1).

Drought at Melfort in 1989, resulted in low yields, averaging 520 kg/ha, and no response to N fertilizer. However, at Aylsham in 1989, yields averaged 1390 kg/ha. Here, there was a large response to N fertilizer, 980 kg/ha yield response to 160 kg N/ha. As well, there was a significant cultivar by fertility interaction at the Aylsham site (Table 2). Highest apparent net return was achieved with Hyola 40 fertilized with 160 kg N/ha (Table 3). However, the considerable extra cost anticipated for this hybrid seed would reduce returns considerably. Most B. napus cultivars gave highest net return with the 120 or 160 kg N/ha rate. Based upon the relative prices of canola and N used for this calculation, Legend and Topas fertilized with 120 kg N/ha were most profitable. In contrast to the B. napus cultivars, the B. campestris cultivars were most profitable with a lower rate of fertilizer, about 40 kg N/ha in this trial. .

Seven cultivars were common to the four sites where N fertilizer response was examined. Because growing conditions were generally dry, there were late summer rains, and fall frosts were late, Global outyielded the other B. napus cultivars. Lowest yields were attained with Tobin. However, there was a significant interaction of site and cultivar.

Overall, 40 kg N/ha gave an economic canola yield increase of 190 kg/ha. Even though N soil tests were lov at each site, additional N fertilizer vould have been uneconomic under such drought. Only at Aylsham in 1989, was the average response to higher N rates economic.

Summary

Combined analysis shoved non-significant interactions for fertility x cultivar and site x fertility x cultivar. Therefore, based upon this combined analysis, there is no justification for a general recommendation for higher or lover rates of N fertilizer application to these seven cultivars. Since this testing vas conducted under unusually dry conditions, and since the one trial, Aylsham, 1989, in which there vas a high yield potential did shov a significant interaction of cultivar and N fertilizer, it is concluded that further tests must be conducted in high yielding environments in order to be able to make firm N fertilizer recommendations for nev canola cultivars.

Table 1. Maturity of Brassica cultivars, Melfort, 1988.

Cultivar	Maturity (d)
Global	109.4a
AU001	107.9a
AU008	105.0b
Topas	104.9b
OAC Triumph	103.0b
Profit	99.9c
Regent	99.5c
OAC Triton	99.2dc
Stellar	98.8dc
Delta	98.7dce
K10-87	97.9dfce
D0195	97.1dfe
Legend	96.5fge
Hyola 40	95.7hfg
Westar	94.2hgi
Tribute	93.7hi
Alto	93.5hi
CS010	92.5i
Tilney (B. hirta)	85.1j
Kirby (B. hirta)	83.1j
Colt (B. campestris)	80.5k
Horizon (B. campestris)	79.3k
Tobin (B. campestris)	72.9l

a-l Means in a column followed by the same letter are not significantly different, LSD (P=0.05).

Table 2. Yield (kg/ha) of canola cultivars at various N fertilizer rates, Aylsham, 1989

Cultivar*	N fertilizer* (kg/ha) 0	40	80	120	160
Delta	990	1560	1510	2000	1940
Global	800	1400	1790	1730	1940
Horizon	690	1240	1190	1400	1270
Hyola	1030	1270	1500	1900	2250
K10-87	720	1270	1370	1870	2000
Legend	820	1330	1580	2090	2160
ACS Parkland	670	1110	1060	1060	1200
Profit	710	1170	1230	1490	1710
Regent	790	1230	1280	1600	1780
Tobin	720	1110	1160	1350	1220
Topas	980	1560	1740	2100	2100
Vestar	640	1120	1310	1650	1760
Mean	800	1270	1390	1690	1780

* Interaction of cultivar and N fertilizer rate was significant for yield.

Table 3. Net return($/ha), gross value of canola less cost of N fertilizer, based on canola @ 26.5¢/kg and nitrogen @ 45¢/kg

	Nitrogen fertilizer rate (kg/ha)				
	0	40	80	120	160
Delta	264	394	364	475	443
Global	212	354	438	403	442
Horizon	182	312	280	316	265
Hyola 40	272	318	362	451	523
K10-87	190	293	327	443	457
Legend	217	335	383	500	500
ACS Parkland	177	276	246	226	247
Profit	188	293	289	340	382
Regent	210	308	304	369	399
Tobin	192	276	271	303	251
Topas	260	396	424	503	485
Westar	170	278	310	383	394

B. SEED RATE AND FERTILIZER RESPONSE

Objective: To compare the response of conventional and high yielding canola cultivars to seed rate and fertility level.

Summary

A similar experiment was also conducted in 1987 under more favorable growing conditions. Those results showed a greater response to seed rate than the 1988 results. However, there was no consistent pattern of differing response to seed rate by the various cultivars. For the most part, differences could be attributed to the stage of varietal maturity and timeliness of rain. There is no evidence to support reduced seed rates for high yielding cultivars. In both years, cultivars did not differ significantly in response to fertility treatments. Overall, the limited data collected would not support recommendation to reduce seed rate or increase fertilizer rate of the new canola cultivars.

C. PHOSPHORUS PLACEMENT AND ROW SPACING

Objective: To examine the yield response of canola to phosphorus utilizing 3 placement-row spacing combinations.

Overall, there was a statistically significant interaction of method and rate of fertilizer application (Table 4). Seed-placed P in both 9 and 18 cm row spacings gave slight but uneconomic increases in canola yield. Banding of fertilizer gave erratic, small yield effects. On average, neither paired-rows nor narrow row spacings gave significant yield increases over conventional seed and fertilizer practice. It is concluded that more trials need be conducted under high yield conditions to identify whether alternative P placement and row spacing configurations offer an advantage under northeastern Saskatchewan conditions.

Table 4. Average yield (kg/ha) response of Westar canola to row spacing and various fertilizer rates and placements, three sites, 1988 and 1989

	Seeding practice*		Fertilizer rate* (kg/ha)			
Row Spacing	N Placement	P Placement	100N-0P	100N-25P	100N-50P	Mean
18 cm	paired-row	paired-row	920	890	1030	950
18 cm	broadcast	paired-row	1070	950	950	990
18 cm	broadcast	with seed	880	1000	940	940
9 cm	broadcast	with seed	880	1010	1010	970
Mean			940	960	980	

* Interaction of seeding practice and fertilizer rate significant for yield.

CANOLA AGRONOMY RESEARCH

(Saskatchevan Canola Grover's Assn. and
Saskatchevan Agriculture Development Fund project)

Melfort Research Station

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ABSTRACT

Drought during 1988 and 1989 in northeastern Saskatchevan gave atypically lov canola yields and poor response to management, thereby negating much of the predictive value of this agronomic research. There vas no consistent pattern of increased response to high fertility levels by nev cultivars, but the one test with good yields shoved highest net returns vhen Hyola 40, Delta, Legend and Topas vere fertilized with high levels of nitrogen. There vas no evidence to support the use of reduced seed rate to compensate for the high price of nev, high yielding cultivars. Neither paired-rov seeding nor seeding in narrov rovs enabled one to increase the phosphorus rate and attain a consistent yield increase over the conventional practice of seeding in 18 cm rovs and applying 25 kg/ha of phosphorus.

CANOLA AGRONOMY FINAL TECHNICAL REPORT TO SASK. CANOLA GROWERS ASSOCIATION

(March 9, 1990)

Research on the agronomy of high yielding canola lines was completed in February 1990 and is summarized in this report. In general, moisture stress in 1988 and 1989 gave poor canola growing conditions. Therefore, recommendations arising from this report may be inappropriate for conditions more typical for production of canola.

A. NITROGEN RESPONSE

Objective: To identify whether an economic difference in response to nitrogen fertilizer exists among canola cultivars of diverse genetic backgrounds.

Treatments:

- 5 nitrogen levels - 0, 40, 80, 120 and 160 kg/ha
- 10 *B. napus* cultivars
- 3 *B. campestris* cultivars
- split block design of 3 reps
- 2 sites

1988 Results

Two sites testing low for N were sown: one at Melfort and the other at Resource. At Melfort, 18 *B. napus* and 3 *B. campestris* lines were tested. At Resource, 11 *B. napus* and 1 *B. campestris* were evaluated.

Analysis of maturity data shows that Global, Topas, and OAC Triumph, cultivars registered in Eastern Canada, are too late maturing for production in Northern Saskatchewan (Table 1). As well, the hybrid lines from Allelix, AU008 and AU001, were also too late maturing. None of the *B. napus* cultivars were significantly earlier than Westar.

There was neither a nitrogen response nor an interaction of cultivar and nitrogen treatments at either 1988 site. Average yield data is shown in Table 2. Westar was outyielded only by Global at one of the two locations. However, Global was 15 days later maturing than Westar and 4.4 days later than AU008 which makes it generally unsuitable for production in the northern Prairies.

1989 Results

This test was seeded at Melfort and Aylsham on soils testing low for both nitrogen and phosphorus. Phosphorus was applied at 50 kg/ha: 25 kg/ha banded and 25 kg/ha seed-placed. The test was expanded to include 23 cultivars at Melfort and 12 at Aylsham.

Again in 1989, hot, dry winds during the seeding period dried out the seedbed at Melfort, and this stress resulted in poor canola emergence. Canola stand for the various cultivars was rated on a scale of 1 (poor) to 5 (good), and the means are presented in Table 3. While significant differences among cultivars are apparent, it is unclear as to whether these differences are genetic or may be related to the vigor of the seed stock provided by breeders. Recent research indicates that the differences were likely due to seed source, and this would have a grave effect on yields of cultivars in the Melfort 1989 experiment.

In contrast to the poor canola stand and anticipated low yields at Melfort, plots at Aylsham emerged uniformly and provided high yields. The Aylsham plots did have an excessively high population of wild mustard, and in order to salvage the nitrogen rate test, many days of roguing were required.

Agronomic data on days to flower and maturity, height, and lodging is shown in Table 4. Analysis of variance showed cultivar differences to be significant, but the interaction of cultivar and N fertility level was not significant.

Drought at Melfort resulted in low yields, averaging 520 kg/ha, (Table 5), and no response to N fertilizer. However, at Aylsham, yields averaged 1390 kg/ha. Here, there was a large response to N fertilizer, 980 kg/ha yield response to 160 kg N/ha. As well, there was a significant cultivar by fertility interaction at the Aylsham site (Table 6). Highest apparent net return was achieved with Hyola 40 fertilized with 160 kg N/ha (Table 7). However, the considerable extra cost anticipated for this hybrid seed would reduce returns considerably. Most B. napus cultivars gave highest net return with the 120 or 160 kg N/ha rate. Based upon the relative prices of canola and N used for this calculation, Legend and Topas fertilized with 120 kg N/ha were most profitable. In contrast to the B. napus cultivars, the B. campestris cultivars were most profitable with a lower rate of fertilizer, about 40 kg N/ha in this trial.

Combined Results, 1988 and 1989

Seven cultivars were common to the four sites where N fertilizer response was examined (Table 8). Because growing conditions were generally dry, there were late summer rains, and fall frosts were late, Global outyielded the other B. napus cultivars. Lowest yields were attained with Tobin. However, there was a significant interaction of site and cultivar.

Overall, 40 kg N/ha gave an economic canola yield increase of 190 kg/ha (Table 9). Even though N soil tests were low at each site, additional N fertilizer would have been uneconomic under such drought. Only at Aylsham in 1989, was the average response to higher N rates economic.

Summary

The objective of this experimentation was to determine whether the current high yielding canola cultivars responded differently to N fertilizer. Combined analysis showed non-significant interactions for fertility x cultivar and site x fertility x cultivar. Therefore, based upon this combined analysis, there is no justification for a general recommendation for higher or lower rates of N fertilizer application to these seven cultivars. However, since this testing was conducted under unusually dry conditions, and since the one trial, Aylsham, 1989, in which there was a high yield potential did show a significant interaction of cultivar and N fertilizer, it is concluded that further tests must be conducted in high yielding environments in order to be able to make firm N fertilizer recommendations for new canola cultivars.

B. SEED RATE AND FERTILIZER RESPONSE

Objective: To compare the response of conventional and high yielding canola cultivars to seed rate and fertility level.

Treatments:

- 2 soil types: Melfort silty clay
  Shellbrook very fine sandy loam
- 3 seed types: 200 seeds/m^2 (approx. 8 kg/ha of Westar)
  100 seeds/m^2
  50 seeds/m^2
- 3 fertility levels: check
  75 kg N/ha (broadcast) + 25 kg P_2O_5/ha (seed placed)
  150 kg N/ha (broadcast) + 50 kg P_2O_5/ha (split: 25 banded and 25 seed placed)
- 5 cultivars: Westar
  OAC Triton
  AU008
  Hyola 40
  Tobin

1988 Results

This test was seeded at Melfort and Carrot River. Due to excessive moisture stress at Carrot River, emergence was uneven, and it was expected that differences in yield among plots would be due to stand as affected by moisture rather than due to differences in crop management practices. Only those plots at Carrot River with a uniform stand were retained, which left an unreplicated trial there. At Melfort, stand was good, but late growing season rains lead to late branching and flowering, especially of AU008.

Reducing the seed rate from the recommended level (8 kg/ha) to one-quarter rate (2 kg/ha) increased the average time to maturity by 1.0 day. The difference in maturity was greater for Tobin than for the *B. napus* cultivars. The lowest seed rate also reduced yield by 120 kg/ha on average. AU008 responded to seed rate differently from other cultivars, increasing yield with lower seed rates. While not readily explainable, this was probably due to a complex interaction of time of moisture use, additional branching with late rains, and later maturity, a complex associated with 1988 and which is unlikely to recur in the near future.

The high fertility regime delayed maturity by 0.8 days as compared to the low fertility treatment. For the latest maturing cultivar, AU008, the delay was 3.0 days while for the earliest cultivar, Tobin, the delay was only 0.8 days. Fertility level had no significant effect on yield, because high fertility treatments used up more moisture producing more vegetative growth, and thus, depleted moisture reserves for reproductive growth.

The effect of seed and fertilizer rates on maturity was additive. On average over cultivars, the high fertilizer and low seed rate was 2.0 days later maturing than the low fertilizer and high seed rate.

1989 Results

This test was seeded at Melfort and Aylsham on soils testing low for both nitrogen and phosphorus. Experimental protocol was followed, except that Global was grown in place of AU008, since AU008 will not be registered by Allelix and there is considerable interest in Global production.

In mid-July, a decision was made to abandon this test. At Melfort, emergence of all cultivars was poor due to a dry seedbed resulting in a poor stand. It was anticipated that differences in yield among plots would be more likely due to stand rather than crop management practice. At Aylsham, a high population of wild mustard choked out the canola, in spite of a somewhat late application of herbicide. Since staff was unable to rogue all plots, it was decided that the Canola Nitrogen Response trial was of greater importance, and it was rogued along with the Phosphorus Placement and Row Spacing trial.

Summary

A similar experiment was also conducted in 1987 under more favorable growing conditions. Those results showed a greater response to seed rate than the 1988 results. However, there was no consistent pattern of differing response to seed rate by the various cultivars. For the most part, differences could be attributed to the stage of varietal maturity and timeliness of rain. There is no evidence to support reduced seed rates for high yielding cultivars. As noted for both years, cultivars did not differ significantly in response to fertility treatments. Overall, the limited data collected would not support recommendation to reduce seed rate or increase fertilizer rate of the new canola cultivars.

C. PHOSPHORUS PLACEMENT AND ROW SPACING

Objective: To examine the yield response of canola to phosphorus utilizing 3 placement-row spacing combinations.

Treatments:

- 3 phosphorus levels - 0, 10 and 20 kg P/ha

- 3 placement-row spacing combinations:

  a) conventional - 18 cm row spacings and seed-placed phosphorus
  b) narrow row - 9 cm row spacings and seed-placed phosphorus
  c) paired row - 18 cm row spacings for seed with phosphorus placed in bands 20 cm deep mid-way between every other pair of rows
  d) as c) but with 100 kg N/ha of ammonium nitrate in bands also

- a cereal stubble, low in phosphorus

- randomized complete block design

- 4 replicates

- 1988 - 3 cultivars: Westar, AU008, CS002
  - 1 site

- 1989 - 1 cultivar: Westar
  - 2 sites: Melfort, Aylsham

1988 Results

In this trial, the Westar and Hyola 40 had similar yields and maturity. AU008 was 10 days later and yielded only two-thirds that of the other cultivars. Maturity was unaffected by the various combinations of row spacing and fertilizer rates and placements.

The treatment with (9 cm) row spacing, broadcasting N, and 'seed-placing' P gave significantly higher yields than other treatments - 120 kg/ha or 13% higher than conventional (18 cm) row spacing, broadcasting N, and 'seed-placing' P. On average, increasing P rate above 25 kg/ha gave no increase in yield.

1989 Results

This test was seeded at Melfort and Aylsham on soils testing low for both nitrogen and phosphorus. Canola establishment was good at both sites with high yields at Aylsham. Drought and heat stress resulted in low yields at Melfort and no response to phosphorus.

At Aylsham in 1989, there was a significant interaction of seeding system with phosphorus rate. Highest canola yield was attained with paired-row banding of 100 kg/ha of nitrogen and 50 kg/ha of phosphorus (Table 16). This gave a 330 kg/ha yield increase over conventional seeding practice in which 25 kg/ha was placed with the seed and 100 kg/ha was broadcast at seeding.

Overall, there was a statistically significant interaction of method and rate of fertilizer application (Table 17). Seed-placed P in both 9 and 18 cm row spacings gave slight but uneconomic increases in canola yield. Banding of fertilizer gave erratic, small yield effects. Even though moisture conditions were more favorable in the 1989 Aylsham trial, there was not a three-way interaction of site with method and rate of P application. On average, neither paired-rows nor narrow row spacings gave significant yield increases over conventional seed and fertilizer practice.

It is concluded that more trials need be conducted under high yield conditions to identify whether alternative P placement and row spacing configurations offer an advantage under northeastern Saskatchevan conditions.

Table 1. Maturity of Brassica cultivars, Melfort, 1988.

Cultivar	Maturity (d)
Global	109.4a
AU001	107.9a
AU008	105.0b
Topas	104.9b
OAC Triumph	103.0b
Profit	99.9c
Regent	99.5c
OAC Triton	99.2dc
Stellar	98.8dc
Delta	98.7dce
K10-87	97.9dfce
D0195	97.1dfe
Legend	96.5fge
Hyola 40	95.7hfg
Westar	94.2hgi
Tribute	93.7hi
Alto	93.5hi
CS010	92.5i
Tilney (B. hirta)	85.1j
Kirby (B. hirta)	83.1j
Colt (B. campestris)	80.5k
Horizon (B. campestris)	79.3k
Tobin (B. campestris)	72.91

a-l Means in a column followed by the same letter are not significantly different, LSD (P=0.05).

Table 2. Yield (kg/ha) of canola cultivars grown on two sites in the Melfort area, 1988.

	Melfort	Resource
Alto	933bcdefg	767bcd
Global	1214a	1216a
Legend	854defg	698bcd
Regent	1043abcd	707bcd
Topas	1104abc	811b
Westar	1223a	825b
AU008	511hi	588de
Hyola 40	1000abcde	617cde
Profit	822defg	793bc
D0195	1000abcdef	706bcd
K10-87	952bcdefg	807b
Tobin (B. campestris)	722gh	497e
AU001	371i	
CS010	894cdefg	
OAC Triumph	758g	
Stellar	871cdefg	
OAC Tribute	764fg	
OAC Triton	756g	
Delta	1156ab	
Horizon (B. campestris)	722gh	
Colt (B. campestris)	896cdefg	
Kirby (B. hirta)	723gh	
Tilney (B. hirta)	774efg	

a-g Means in a column followed by the same letter are not significantly different LSD (P=0.05).

Table 3. Canola cultivar establishment, Melfort, 1989

Cultivar	STAND*
Tilney (B. hirta)	4.7 a
Delta	4.3 ab
Kirby (B. hirta)	4.0 abc
K4-87	4.0 abc
K10-87	3.3 bcd
OAC Triumph	3.3 bcd
Horizon (B. campestris)	3.0 cde
Celebra	3.0 cde
K36-87	2.7 def
K1-7	2.7 def
Vanguard	2.7 def
Legend	2.3 defg
Triton	2.3 defg
Tobin (B. campestris)	2.3 defg
Parkland (B. campestris)	2.0 efg
Hyola 40	2.0 efg
Westar	2.0 efg
Global	2.0 efg
Tribute	1.7 fgh
Topas	1.3 gh
Regent	1.3 gh
Stallion	1.3 gh
Profit	0.7 h

* - Stand rated on 0-5 scale with 0 poor and 5 good

a-h Mean separation based on LSD (P = 0.05)

Table 4. Agronomic performance of canola cultivars, Melfort and Aylsham, 1989

	Melfort			Aylsham	
	flower (d)	height (cm)	maturity (d)	height (cm)	lodging (1-9)
Celebra	52.0bc	76.1cdef	95.0cde		
Delta	48.0e	73.0efg	88.0h	109.4a	1.8bc
Global	56.0a	82.3a	99.0a	107.9ab	1.6c
Hyola 40	50.0cde	76.1cdef	89.0gh	102.3bc	2.0bc
Legend	50.0cde	77.4c	88.0h	103.8abc	1.8bc
Profit	56.0a	76.6cd	96.0bcd	100.4c	2.4b
Regent	52.0bc	73.1defg	95.0cde	101.8bc	2.5b
Stallion	54.0ab	78.8abc	97.0abc		
Topas	56.0a	82.0ab	98.0ab	101.6c	1.3c
Tribute	51.0cd	72.9fg	91.0fg		
OAC Triton	52.0bc	65.2y	97.0abc		
OAC Triumph	51.0cd	73.5defg	94.0de		
Vanguard	52.0bc	76.4cdef	95.0cde		
Westar	49.0de	76.5cde	88.0h	102.7bc	2.4b
K1-7	50.0cde	82.3a	89.0gh		
K10-87	49.0de	78.6bc	88.0h	106.5abc	2.0bc
K36-87	50.0cde	81.9ab	93.0ef		
K4-7	49.0de	65.9ij	87.0h		
ACS Parkland	42.0f	71.5gh	76.0i	89.5d	7.5a
Horizon	42.0f	67.6i	76.0i	89.4d	7.4a
Tobin	40.0fg	68.4hi	74.0i	91.9d	7.3a
Kirby	38.2g	61.3k	76.oi		
Tilney	38.2g	64.0jk	74.0i		

a-i Means in a column followed by the same letter are not sigfnificantly different, LSD (P=0.05).

Table 5. Yield (kg/ha) of canola cultivars, Melfort and Aylsham, 1989

Cultivar	Melfort	Aylsham
Celebra	610bcdef	
Delta	750ab	1600ab
Global	570bcdefg	1530ab
Hyola 40	490efghi	1590ab
Legend	550cdefgh	1600ab
Profit	240k	1260cde
Regent	480fghi	1340cd
Stallion	400ghijk	
Topas	310ijk	1700c
Tribute	360hijk	
OAC Triton	280jk	
OAC Triumph	430fghijk	
Vanguard	480fghi	
Westar	490efghi	1290cde
K1-7	510defgh	
K10-87	500efghi	1430bc
K36-87	490efghi	
K4-7	480fghi	
ACS Parkland	470fghiu	1020f
Horizon	680abcde	1160def
Tobin	700abcd	1110ef
Kirby	730abc	
Tilney	860a	

a-k Means in a column followed by the same letter are not sigfnificantly different, LSD (P=0.05).

Table 6. Yield (kg/ha) of canola cultivars at various N fertilizer rates, Aylsham, 1989

Cultivar*	N fertilizer* (kg/ha)				
	0	40	80	120	160
Delta	990	1560	1510	2000	1940
Global	800	1400	1790	1730	1940
Horizon	690	1240	1190	1400	1270
Hyola	1030	1270	1500	1900	2250
K10-87	720	1170	1370	1870	2000
Legend	820	1330	1580	2090	2160
ACS Parkland	670	1110	1060	1060	1200
Profit	710	1170	1230	1490	1710
Regent	790	1230	1280	1600	1780
Tobin	720	1110	1160	1350	1220
Topas	980	1560	1740	2100	2100
Westar	640	1120	1310	1650	1760
Mean	800	1270	1390	1690	1780

* Interaction of cultivar and N fertilizer rate was significant for yield.

Table 7. Net return($/ha), gross value of canola less cost of N fertilizer, based on canola @ 26.5¢/kg and nitrogen @ 45¢/kg

	Nitrogen fertilizer rate (kg/ha)				
	0	40	80	120	160
Delta	264	394	364	475	443
Global	212	354	438	403	442
Horizon	182	312	280	316	265
Hyola 40	272	318	362	451	523
K10-87	190	293	327	443	457
Legend	217	335	383	500	500
ACS Parkland	177	276	246	226	247
Profit	188	293	289	340	382
Regent	210	308	304	369	399
Tobin	192	276	271	303	251
Topas	260	396	424	503	485
Westar	170	278	310	383	394

Table 8. Average yield (kg/ha) of seven canola cultivars grown at four sites in northeastern Saskatchevan, 1988 and 1989

	Year and Site				
	1988		1989		
Cultivar	Melfort	Resource	Melfort	Aylsham	Mean
Global	1210	1210	570	1530	1140a
K10-87	950	780	500	1430	900b
Legend	850	670	550	1600	890b
Regent	1040	690	480	1340	880b
Tobin	720	470	700	1110	730c
Topas	1100	790	310	1700	980b
Westar	1220	790	490	1290	960b
Mean	1010	770	510	1430	

Table 9. Average yield (kg/ha) of canola produced with various N fertilizer rates at four sites in northeastern Saskatchevan, 1988 and 1989

	N fertilizer (kg/ha)				
Year & Site	0	40	80	120	160
1988 Melfort	860	1040	1020	1060	1070
1988 Resource	790	810	800	730	740
1989 Melfort	480	580	530	480	500
1989 Aylsham	780	1280	1460	1770	1850
Mean	740	930	950	990	1020

10. Maturity (d) of canola cultivars sown at various rates, Melfort, 1988.

Cultivar*	Seed rate* (kg/ha) 2	4	8	Mean
AU008	103.0	102.5	103.0	102.9
Hyola 40	97.5	96.9	96.8	97.1
OAC Triton	101.6	101.7	100.8	101.3
Westar	96.5	96.3	96.2	96.3
Tobin	79.0	77.8	77.2	78.0
Mean	94.5	93.9	93.5	

* Interaction of cultivar and seed rate significant for maturity.

Table 11. Maturity (d) of canola cultivars fertilized at various rates, Melfort, 1988.

Cultivar*	Fertilizer rate* (kg/ha)			
	0N-25P	75N-25P	150N-50P	Mean
AU008	101.0	104.5	104.0	102.9
Hyola 40	96.0	97.5	97.7	97.1
OAC Triton	100.8	101.8	101.4	101.3
Westar	96.0	96.0	96.9	96.3
Tobin	78.0	77.7	78.3	78.0
Mean	93.6	94.0	94.4	

* Interaction of cultivar and fertilizer rate significant for maturity.

Table 12. Maturity (d) of canola cultivars sown at various rates and fertilizer at three levels.

Fertilizer rate *(kg/ha)	Seed rate *(kg/ha) 2	4	8	Mean
0N - 25P	94.2	93.9	92.9	93.6
75N - 25P	94.5	93.9	93.5	94.0
150N - 50P	94.9	93.8	94.3	94.4
	94.5	93.9	93.5	

* Interaction of seed and fertilizer rate significant for maturity.

Table 13. Yield (kg/ha) of canola cultivars sown at various rates, Melfort, 1988.

Cultivar*	Seed rate* (kg/ha) 2	4	8	Mean
AU008	620	570	550	580
CS002	760	890	950	870
OAC Triton	530	610	690	610
Vestar	860	950	1020	940
Tobin	590	660	740	660
Mean	670	740	790	

* Interaction of cultivar and seed rate significant for yield.

Table 14. Maturity and yield response of canola cultivars to phosphorus placement and row spacing, Melfort, 1988.

cultivar	Maturity (d)	Yield (kg/ha)
AU008	106.4a	690b
Hyola 40	96.5b	1070a
Westar	96.0b	1060a

a-b Means in a column followed by the same letter are not significantly different, LSD (P = 0.05).

Table 15. Average yield (kg/ha) response of three canola cultivars to row spacing and various fertilizer rates and placements, Melfort 1988.

Seeding Practice*			Fertilizer rate* (kg/ha)			
Row Spacing	N Placement	P Placement	100N-0P	100N-25P	100N-50P	Mean
18 cm	paired-row	paired-row	950	950	930	940b
18 cm	broadcast	paired-row	830	980	900	900b
18 cm	broadcast	with seed	800	920	970	900b
9 cm	broadcast	with seed	980	990	1080	1020a
Mean			900b	980a	970a	

* Interaction of seeding practice and fertilizer rate significant for yield.

Table 16. Average yield (kg/ha) response of three canola cultivars to row spacing and various fertilizer rates and placements, Aylsham 1989.

Seeding Practice*			Fertilizer rate* (kg/ha)			
Row Spacing	N Placement	P Placement	100N-0P	100N-25P	100N-50P	Mean
18 cm	paired-row	paired-row	1200	1230	1630	1380
18 cm	broadcast	paired-row	1420	1330	1330	1360
18 cm	broadcast	with seed	1150	1300	1260	1230
9 cm	broadcast	with seed	1250	1440	1370	1360
Mean			1260	1330	1400	

* Interaction of seeding practice and fertilizer rate significant for yield.

Table 17. Average yield (kg/ha) response of Westar canola to row spacing and various fertilizer rates and placements, three sites, 1988 and 1989

Seeding practice*			Fertilizer rate* (kg/ha)			
Row Spacing	N Placement	P Placement	100N-0P	100N-25P	100N-50P	Mean
18 cm	paired-row	paired-row	920	890	1030	950
18 cm	broadcast	paired-row	1070	950	950	990
18 cm	broadcast	with seed	880	1000	940	940
9 cm	broadcast	with seed	880	1010	1010	970
Mean			940	960	980	

* Interaction of seeding practice and fertilizer rate significant for yield.